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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/081,916	02/20/2002	Delman Lee	YAMAP0801US	2192

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EXAMINER

STREGE, JOHN B

ART UNIT	PAPER NUMBER
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2625

DATE MAILED: 08/08/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/081,916

Applicant(s)

LEE ET AL.

Examiner

John B. Strege

Art Unit

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 03 May 2005.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-42 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 1-21 and 35-38 is/are allowed.
- 6) ☒ Claim(s) 22-30, 32-34 and 39-42 is/are rejected.
- 7) ☒ Claim(s) 31 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 20 February 2002 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date 6/15/05.

- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

Response to Amendment

1. The amendment received 5/3/05 has been entered in full.
2. Applicant's arguments with respect to claims 22-42 have been considered but are moot in view of the new ground(s) of rejection.

Examiner's Comment

3. Although the drawings are accepted by the Examiner, the figures 7-11 have been partially cut off. Examiner recommends that new complete copies of these figures be submitted in response to this action.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claims 22-27, 33-34, and 39-40 are rejected under 35 U.S.C. 103(a) as being unpatentable over the IEEE article by Courtney et al. *A Hardware Architecture for Image Rectification and Ground Plane Obstacle Detection* (hereinafter "Courtney") (discussed in the Applicant's prior art on pages 8-9), in view of Zhang et al. USPN 6,608,923 (hereinafter "Zhang").

Regarding claim 22, as stated by the Applicants on pages 8-9 of the specification, Courtney is one of the systems shown in the prior art system of figure 3(b)

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involving a rectification system that determines transformations to rectify the images to reduce vertical disparity. Courtney discloses determining rectification transforms to reduce vertical disparity (section 2, page 24) and further states that an image may be transformed so that the epipolars are aligned to rasters in each image in the other to simulate a parallel camera setup (page 23, first paragraph of the introduction). Courtney further discloses using an internal camera parameter for computing the matrix elements (section 2).

Courtney does not explicitly disclose that determining a first and second rectification transformation that includes calculating a shear component such that a final matrix is a combination of a rotation and a translation and at least one internal camera parameter. Zhang discloses a method for rectifying three dimensional objects that is comprised of a first transform and an optional second transform (see at least the abstract). Zhang further discloses that if the intrinsic parameters of a camera are known, the images are calibrated and using the fundament matrix from these parameters the images can be rectified through a transformation process (col. 6 lines 55-65).

Furthermore as seen in figure 7 the transform includes calculating a shear component using a combination of a rotation and a translation with the internal camera parameters. The process of Zhang is beneficial in that it is more efficient than the prior art systems and allows for rectifying images with optimally reduced distortion (col. 1 lines 63-67).

Courtney and Zhang are analogous art because they are from the same field of endeavor or rectification of stereoscopic images.

At the time of the invention it would have been obvious to one of ordinary skill in the art to combine Courtney and Zhang to determine a first and second rectification transformation that includes calculating a shear component such that a final matrix is a combination of a rotation and a translation and at least one internal camera parameter. The motivation for doing so is that it would reduce distortion in the system of Courtney. Thus it would have been obvious to one of ordinary skill in the art at the time of the invention to combine Courtney and Zhang to obtain the invention of claim 22.

Regarding claim 23, Courtney discloses that the matrix elements of the transforms may be computed from camera calibration parameters including aspect ratios, focal lengths, etc. (last paragraph of section 2). Statistics are defined in Webster's dictionary as a collection of quantitative data, thus these camera calibration parameters can be read as statistics of the parameters of the image capture device.

Regarding claim 24, the camera calibration parameters are used for the alignment of the images thus they relate to the alignment of the first image capture device relative to the second image capture device.

Regarding claim 25, as seen in figure 7, Zhang discloses finding a first and second component of each of the first and second rectification transformations, the first being the similarity transform 712, and the second being the shearing transform 714. The process of Zhang is beneficial in that it is more efficient than the prior art systems and allows for rectifying images with optimally reduced distortion (col. 1 lines 63-67). Similar to Courtney who aligns the epipoles to simulate a parallel camera geometry (first

paragraph of the introduction), Zhang is also interested in making the epipolars lines parallel (col. 1 lines 25-37)(thus simulating a parallel camera geometry also).

Regarding claims 26-27, as discussed above Courtney discloses using statistics of the parameters of the stereoscopic image capture device and the parameters relate to the alignment of the cameras.

Regarding claim 33, as seen in figure 1 Courtney rectifies the images.

Regarding claim 34, as seen in figure 2 Courtney discloses producing an output stereoscopic image.

Claims 39-40 are similar to the limitations discussed above thus the same arguments used for the above claims apply equally to claims 39-40.

6. Claims 28-30, 32, and 41-42 are rejected under 35 U.S.C. 103(a) as being unpatentable over Courtney et al. *A Hardware Architecture for Image Rectification and Ground Plane Obstacle Detection* (hereinafter "Courtney") in view of Zhang et al. USPN 6,608,923, in view of Lipton et al. USPN 5,142,357 (hereinafter "Lipton") and further in view of the Applicant's admitted prior art.

Regarding claims 28-29, Courtney does not explicitly disclose whether or not the image is a still image or part of a video image since it is mainly concerned with rectifying the image. However it is well known that a stereoscopic images can be created as still images or part of a video image.

Lipton discloses a stereoscopic camera that can be used for video or still images (as stated at least in the abstract).

Lipton, Zhang and Courtney are analogous art because they are from the same field of endeavor of stereoscopic imaging.

At the time of the invention it would have been obvious to one of ordinary skill in the art that the invention as disclosed by Courtney could be used for a still stereoscopic image or a video stereoscopic image since both types of existing systems could be improved by rectification. Thus it would have been obvious to one of ordinary skill in the art to combine Lipton, Zhang and Courtney to obtain the invention as specified in claims 28-29.

Regarding claim 30, Courtney nor Lipton disclose rectifying subsequent frames of the stereoscopic video image using the first and second rectification transformations determined for the first frame of the stereoscopic video image.

In the Applicant's admitted prior art (figures 3a-3c) the Applicant states that once suitable rectifying transformations have been determined from one captured image pair, a subsequent captured image pair acquired using the same camera set-up can be directly warped at step 15 using the rectifying transformations determined earlier (page 8 lines 5-20).

Courtney, Lipton, Zhang, and the Applicant's admitted prior art are all analogous art because they all deal with stereoscopic cameras.

At the time of the invention it would have been obvious to one of ordinary skill in the art to combine Courtney, Lipton, Zhang and the Applicant's admitted prior to rectify subsequent frames of the stereoscopic video image using the first and second rectifications used for the first frame.

Regarding claim 32, it would be obvious to carry out the rectification of each frame of a video image using the method of Courtney since each frame would need to be rectified to improve the stereoscopic image.

Regarding claims 41-42, Lipton discloses a data processor (87 of figure 12).

Allowable Subject Matter

7. Claims 1-21, and 35-38 are allowed.

8. The following is an examiner's statement of reasons for allowance: Regarding claim 1, as stated by the Applicant, none of the prior art discloses a method of rectifying a stereoscopic image characterized in that the method comprises using statistical probability analysis of the parameters of the stereoscopic image capture device in the determination of the first and/or second rectification transformations. As stated in the previous office action the closest prior art consists of Courtney and Papadimitriou, however Courtney and Papadimitriou assume that the parameters of the cameras are known in order to carry out the rectification. Thus claim 1 and its dependent claims 2-21 are allowable over the prior art. Claim 35 is similar to claim 1, thus is allowable for the same reasons given for claim 1. Claims 36-38 depend on allowable claim 35, thus they are allowable for the same reason.

9. Claim 31 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Conclusion

10. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

USPN 5,917,937, Method for performing stereo matching to recover depths, colors and opacities of surface elements.

USPN 6,125,198, Method of matching stereo images, and method of measuring disparity between those images.

11. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.


Contact Information

Any inquiry concerning this communication or earlier communications from the examiner should be directed to John B. Strege whose telephone number is (571) 272-7457. The examiner can normally be reached on Monday-Friday between the hours of 8-5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Bhavesh Mehta can be reached on (571) 272-7453. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

JS


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